well adapted to the requirements of students, and the presentation of the subject-matter is always clear. In the biological sections Transatlantic freedom of style is sometimes carried so far as to savour of the evening Press, paragraphs being headed, for example, "New Devices of the Bryozoans" and "The Protozoans make a Record." The abundant figures are well chosen, and, within the limitations of black and white, usually well executed, but the glazed paper, on which the whole is printed, is an offence to the sensitive eye. The work as a whole is one which will find a welcome in England as well as in America. The planetesimal theory, too, whatever its ultimate fate, is at least a spirited protest against any narrow limitation of geological time, and may serve to fortify timid geologists against the thunders of certain mathematicians, too apt to forget the precarious basis upon which their calculations are built. A. H.

THE GENESIS OF THE INVENTOR.

Erfindung und Erfinder. By A. du Bois-Reymond. Pp. vi+284. (Berlin: J. Springer, 1906.) Price 5 marks.

IN his opening chapter, Herr du Bois-Reymond gives an historical survey of the development of the Patent Laws in civilised countries. They date from the Act of Parliament passed in the year 1623, which in its first clause abolished the long-standing grievance known as monopolies, by which favoured individuals had the exclusive right to sell such things as salt and coal; the second clause established a new variety of monopoly, out of which patent rights had their origin. Little has been altered in principle since that date. Even down to the term of fourteen years the system still holds good, rights being granted to "any new manufactures." Other countries, adopting the idea at much later dates, attempted a more formal definition of invention, and legal logic has constantly tried to define the admissible and the inadmissible. Herr du Bois-Reymond shows that in Germany, since the year 1889, the number of patents granted has varied between 29 per cent. and 45 per cent. of the number of applications filed, and, therefore, assuming the quality of the inventions to be on an average the same from year to year, it would seem that the official mind is not yet certain in its workings.

The author's analysis of the nature of invention and inventors leads to the conclusion that neither need, nor chance, nor the lack of necessaries in surrounding life suffices to draw out the inventor. Instead of solving the problem by philosophic deductions from generalities, he descends to the particulars of the Patent Office, and concludes that inventors can be subdivided into three classes:—first, the intuitive genius, or, as Herbert Spencer would have said, the man who can do with little trouble that which cannot be done by the ordinary man with any amount of trouble; secondly, the technical man, well acquainted with his work, who follows in the wake of the intuitive genius, and is largely inspired by him; thirdly, the layman, whose special province seems to be feeding-bottles. We are inclined to think that too much stress can be laid on the existence and qualifications of the first class. A long series of inductive reasonings, followed generally by equally laborious experiment, is the usual course of a successful invention. Helmholtz and Darwin were not inventors, but their methods were the same. Helmholtz said that in his work he could only liken himself to the mountaineer, painfully and slowly climbing, often obliged to turn backwards, lighting later on new traces leading forward, and finally reaching the goal, only to find to his confusion that a plain road led thither, if he had only had the eyes to see. Darwin said he thought he was superior to the common run of men in noticing things which easily escape attention, and in observing them carefully. "My industry has been nearly as great as it could have been in the observation and collection of facts." Herein lies the real spirit of the pioneer. Nothing is more useful than the quality on which Darwin naïvely lays stress, viz. that of noticing things which escape attention; and those who hope to reach the promised land without wandering in the wilderness are probably doomed to disappointment.

Superficially, chance seems to play a large part; but Herr du Bois-Reymond maintains that chance only determines whether this or that individual shall do the deed, and has nothing to do with whether or not the deed shall be done. This is probably true in those cases in which attention is directed to a problem from various sides owing to a main directing cause. Such was the result of Moissan's discovery of the production of calcium carbide in the electric furnace. The acetylene generator seems to follow as a matter of course. Moissan had no heed for the commercial exploitation of such things, and many others, becoming aware of the existence of an obvious need, which appeared to be capable of being dealt with without the aid of the calculus, rushed in, left the relics of their labours in the files of the Patent Office, and discovered later that they were wholly unacquainted with the conditions of the problem. In this case mere inspiration leads nowhere; laborious experiment is much more to the point, and chance only comes in, having regard to the number of men at work on the task, in determining who shall lodge his application first. That cannot properly be called chance which is merely the outcome of some unlooked-for combination or slight variation of procedure; it is precisely for these things that the inventor toils, and when they come within his sight he merely recognises that for which he has patiently hoped.

Herr du Bois-Reymond concludes by considering the reaction on civilised life which is due to the existence of the inventor. The idea of protecting the inventor was only an indirect cause of the Patent Laws in most countries. A more direct impulse was probably given by the view that the prosperity of the State was likely to be increased by such encouragement as could be given to the creation of industries. Still, Faraday's commercial value has been incalculable, but he received little encouragement from Patent Laws, while

Watt was obliged to circumvent them in order to carry on his business. Moreover, the State undoubtedly profits directly. It is asserted by men competent to judge that the amount received in patent fees is greater than all the profits made by inventors. In other words, the average profit made on an invention is not sufficient to cover the charges made by the State. Herr du Bois-Reymond's book may be recommended to those who take an interest in the philosophic analysis of these questions, and they may also hope to find much worldly wisdom scattered throughout its pages, and a wealth of illustration, drawn from the experience of a busy life.

W. H. S.

BIOLOGICAL PHILOSOPHY.

Psychology (pp. 124); *Sociology* (pp. 124); *Ethics* (pp. 118). By Dr. C. W. Saleeby. Three vols. Scientific Series. (Edinburgh and London: T. C. and E. C. Jack.) Price 1s. net each.

DR. SALEEBY discusses the problems of philosophy from the Spencerian standpoint in an interesting fashion. Of the three volumes, that on Psychology appears much the best; it is the most serious, and though the author has there one *bête noire* in the person of Dr. Ward, who suffers vicariously for all the sins of "academic psychology," the reader is not wearied, as in the Ethics volume, by incessant declamation against Nietzscheanism, on the one hand, and what is politely called "hell-fire morality" on the other.

On psychology our author has nothing very startling to say. He defines his subject as the science, not of consciousness, but of mind. He favours the Wundtian theory of psychophysical parallelism. He regards mind as a product and phenomenon of evolution; or rather, having boldly stated that life is prior to mind, he closes one of two chapters on the evolution of mind by maintaining that the responsiveness of the leucocyte to irritation points to sentiency on its part, and by withdrawing his bold statement in favour of a bolder, that life and mind are co-equal, co-extensive, and of common origin. That is to say, he levels up the leucocyte to man. In the latter part of his book he dwells much more on the will than on the intellectual functions, as he wishes, not to lead up to a text-book on logic, but to the consideration of conduct. The result is that many questions which one finds discussed in the ordinary handbooks are not even mentioned in this; but, of course, amid the multiplicity of cheap introductory works there is no reason why all should go in the same ruts.

In the volume on Sociology one notes that our author follows the Spencerian line that the State has no consciousness of its own, and therefore the welfare of the State never means anything more or other than the welfare of the citizens. He follows his master, too, very closely in his opposition to free education, which he thinks as bad as free breakfasts for the children. A later chapter is occupied with an indictment of the modern city, and others with a discussion of socialism, conservatism, and liberalism.

The volume on Ethics has some excellences—the discussion of the origin of morality, for example, with what the author regards as the most important proposition he has to offer, viz. that organic evolution, reproductive evolution, and moral evolution are interdependent. Some other things are not quite so convincing—the statement that there has been far more vicious than virtuous obedience in human history, or another that morality is æons of æons older than the oldest creed, the proof offered being that a cat cares for its kittens. Apparently morality began ages before man was ever heard of, though, in a different context, Dr. Saleeby describes a baby as "non-moral, pre-moral, or if you like, immoral."

There is a hard saying on one page to the effect that historians of the (inaccurate and picturesque) school of Carlyle and Froude are no longer in request. This comes with rather a bad grace from one whose merits are probably—*quanto intervallo!*—much like those of the writers named; while his defects include an inadequate apprehension of the real issues involved and a stumbling knowledge of Greek. For *logos* does not mean science, nor is teleology derived from the word meaning "at a distance."

BIOLOGY OF THE FROG.

The Biology of the Frog. By Samuel J. Holmes, Ph.D. Pp. vii+370. (New York: The Macmillan Company; London: Macmillan and Co., Ltd., 1906.) Price 6s. 6d. net.

IN the vast literature that treats of the frog there is no comprehensive summary of its biology. Every natural history teacher has realised this want, which has increased in proportion with the great recent extension of instruction in elementary natural phenomena. No animal is more thoroughly known from the anatomical, histological, and embryological aspects, but on the side that appeals to teachers and commencing students, the study of habit and function, existing knowledge of the frog is scattered and often untrustworthy. This gap the author strives to fill, writing primarily for the student. His book is a compilation of what is known of the behaviour of the frog and of its several organs. Unfortunately it is not only this. Dr. Holmes has not freed himself sufficiently from formal and dogmatic zoology. He must have all the nomenclature and the anatomy of the medical school, as though we could never learn or teach zoology without a load of descriptive structural details. The new wine of comparative physiology has been poured into the old vessel and has burst it, leaking out now here now there, so that no good draught is obtainable. The wine, however, is good, and the more pity the framework was not better adapted to hold it and yield it to the thirsty soul.

The frog enters on p. 62, chapter ii. Here "we begin our study." Unfortunately there are two earlier chapters, with which most readers will begin. The first deals with the classification of Amphibia, and ought to have been simplified or postponed. The